



Introducing IPAV: The Case for International Infrastructure Development

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Topic: **Thematic**

On August 28, 2024, we listed the Global X Infrastructure Development ex-U.S. ETF on the CBOE BZX. IPAV seeks to invest in stocks that potentially stand to benefit from infrastructure development in international markets, including emerging and developed markets but excluding the United States.¹ This includes companies that are involved in engineering and construction services; the production of infrastructure raw materials and composites; the production and distribution of heavy construction equipment and products; infrastructure transportation; and the manufacturing or selling of smart grid components.

Global infrastructure development appears poised for a resurgence, driven by converging factors such as evolving demographics, growing consumption of products and services, supportive government policies, public and private investment, aging assets, and the adoption of computationally intensive emerging technologies such as generative AI and electric vehicles (EVs). While these trends are clearly visible in the United States, they are just as pronounced on the international stage, with numerous countries around the world seemingly on the brink of substantial increases in infrastructure development activity. A prime example is the widespread need for power grid upgrades and expansions. We believe the international infrastructure theme presents a compelling opportunity for investors seeking exposure to international markets and a sector at the center of the structural trends changing our world.

Key Takeaways

- Infrastructure development is likely to gain pace over the coming years as several powerful global tailwinds converge, including technology advancements, global fragmentation, climate change, aging infrastructure assets, and shifting demographics.
- Supportive government policies and potentially trillions in government funding could lead to increased development activity for a wide range of infrastructure assets, including roads, bridges, buildings, renewable energy, power grids, and data centers.
- Companies that stand to potentially benefit from increased development activity include those that provide the equipment, materials, transport, engineering, and construction services for infrastructure assets.

Infrastructure Development Is Central to the Structural Trends Reshaping the World

Several structural trends are rapidly transforming the world and creating the potential for monumental shifts in the world's economies over the coming years. First, disruptive technologies such as generative AI, Electric Vehicles (EVs), and renewable energy are advancing at a swift pace, changing how we go about our day-to-day lives. For example, AI software sales could increase from a forecasted \$11 billion in 2024 to \$204 billion in 2030.² The market share for EVs, including both battery EVs and plug-in hybrids, is forecast to increase from 16% of global sales in 2023 to 42% of global sales by 2030.³

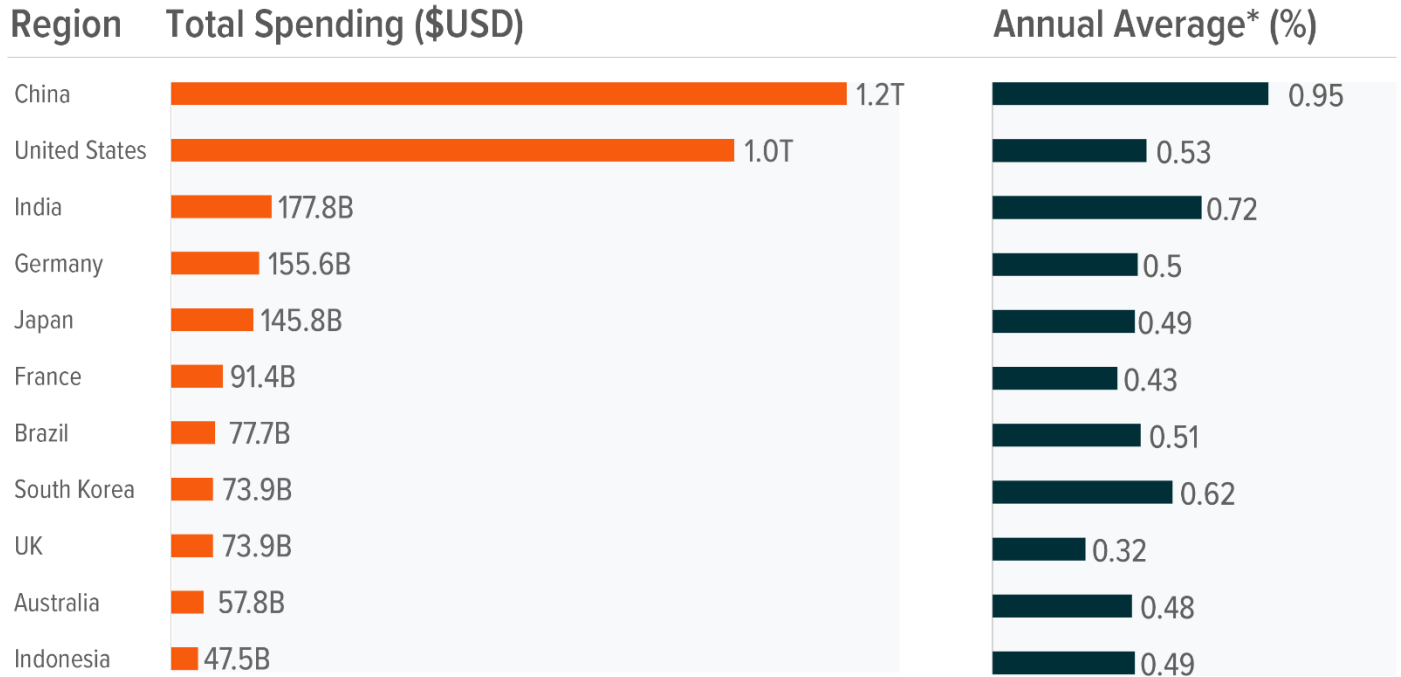
Significant investment into infrastructure assets will likely be needed to support the expected growth rates for these technologies. In the first half of 2024, Alphabet, Amazon, Meta, and Microsoft combined to spend nearly \$104 billion in capital expenditures, up 47% year-over-year, with a heavy focus on data centers.⁴ Microsoft is set to invest over \$16 billion on AI infrastructure across many countries, including Japan, France, Germany, Spain, Malaysia, and Indonesia.⁵ Amazon's AI infrastructure investment plans include \$15 billion in Japan, \$1.3 billion in France, \$9 billion in Singapore, and \$5 billion in Mexico.⁶ Alphabet spent \$13 billion on technical infrastructure in Q2 2024.⁷ To support EV growth, the number of public EV charging points globally will likely need to grow four-fold, from 4 million points in 2023 to more than 15 million by 2030. China and Europe are forecast to remain the top two regions with the largest number of EV chargers.⁸

In the power sector, governments will likely need to invest trillions into power grids through 2030 in order to stay on track with energy transition targets and support growth in renewables, EVs, and AI. To meet net-zero emissions targets, China needs to spend an estimated \$1.2T on power grid investments between 2024 and 2030, while India, Germany, and Japan likely need to invest between \$145B and \$178B.⁹ The total price tag for overhauling global power grid infrastructure to support the clean energy transition is estimated at \$24.1 trillion through 2050.¹⁰



SIGNIFICANT POWER GRID INVESTMENTS ARE NEEDED IN MANY MAJOR ECONOMIES (REQUIRED INVESTMENT ESTIMATES FOR POWER GRIDS FROM 2024-2030, BY HIGHLIGHTED COUNTRY)

Sources: Global X ETFs with information derived from: Bloomberg. (2024, July 15). The World's Power Grids Are Failing as the Planet Warms.



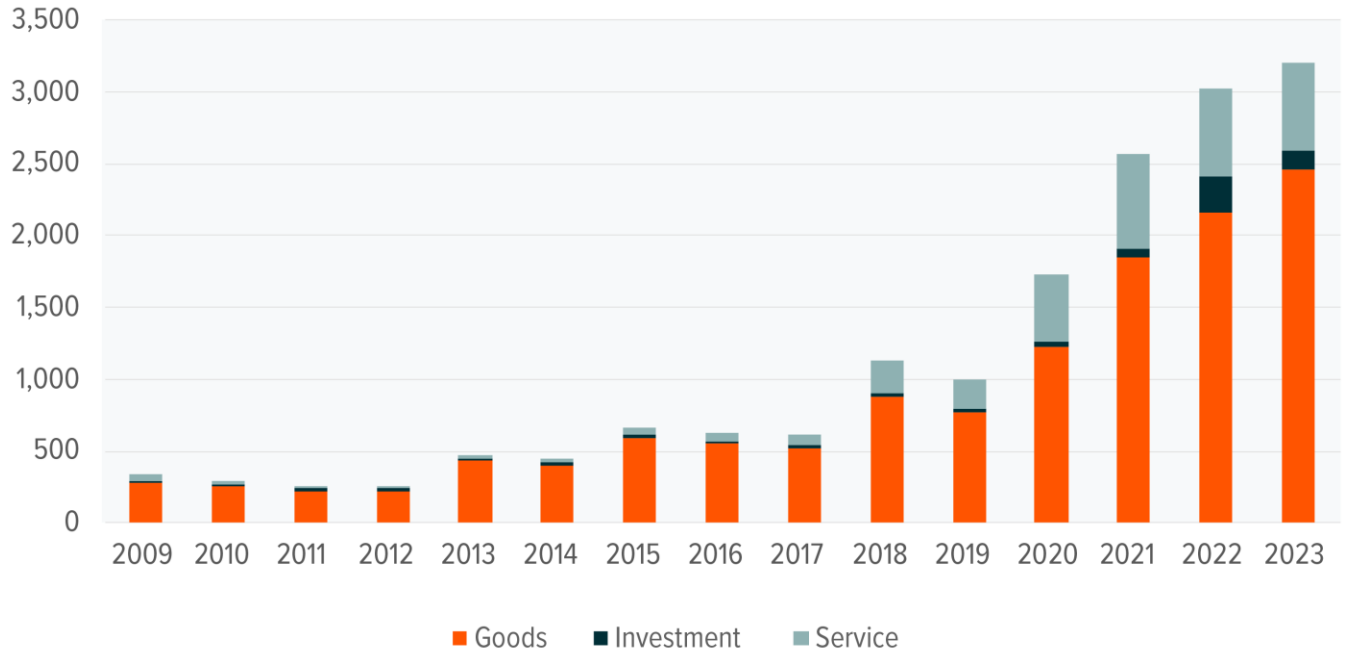
*Annual Average is represented as a proportion of 2023 GDP for each respective country.

Second, the global political landscape is becoming increasingly fractured as nations work to boost energy security and supply chain resilience, as well as compete for global influence. Many governments are beginning to implement policies to grow their domestic manufacturing footprints, which will require the construction of new production facilities. For example, the EU is considering a €100 billion fund that could help boost defense manufacturing in the region.¹¹ Additionally, the EU and China are spending billions to finance infrastructure projects abroad. The EU aims to allocate €300 billion towards international infrastructure projects by 2027 through its Global Gateway program. China's Belt and Road initiative has already deployed roughly \$370 billion in overseas construction projects.¹²



INCREASING TRADE RESTRICTIONS SUGGEST GROWING GLOBAL FRAGMENTATION (NUMBER OF TRADE RESTRICTIONS IMPOSED ANNUALLY WORLDWIDE, BY SEGMENT)

Sources: Global X ETFs with information derived from: Global Trade Alert. (n.d.). Global Dynamics: Number of Implemented Interventions Since November 2008. Accessed on August 14, 2024.



Note: Totals across all segments only include trade restrictions that have been categorized as potentially ‘harmful’.

Shifting demographics globally are also likely to create new infrastructure needs in many regions. The world’s urban population is forecast to increase 1.5x between 2023 and 2045 to reach approximately 6 billion people.¹³ By 2050, around 70% of the world’s population could be living in cities.¹⁴ Emerging economies throughout Africa and Asia are expected to account for much of the urban population growth. Notably, Africa’s cities are the most rapidly growing and youngest in the world.¹⁵ Supporting younger, more urban populations will likely require governments to invest in a wide range of infrastructure for continued social and economic mobility, including housing, roads, water and sanitation infrastructure, electricity distribution infrastructure, and e-commerce, among others.

Yet another structural trend, climate change, is directly influencing tech adoption, geopolitics, and global demographics while also creating direct risks for many infrastructure assets. For example, road, railway, and runway conditions can all be negatively impacted by extremely high temperatures, which can lead to operational delays and safety risks. Retrofitting or rebuilding infrastructure to withstand a changing climate represents a significant investment opportunity. Staying on track to meet both climate change mitigation targets and sustainable development goals could require as much as \$6.9 trillion annually in global sustainable infrastructure investments through 2030.¹⁶

Aging Infrastructure Assets Are Creating Additional Infrastructure Development Needs

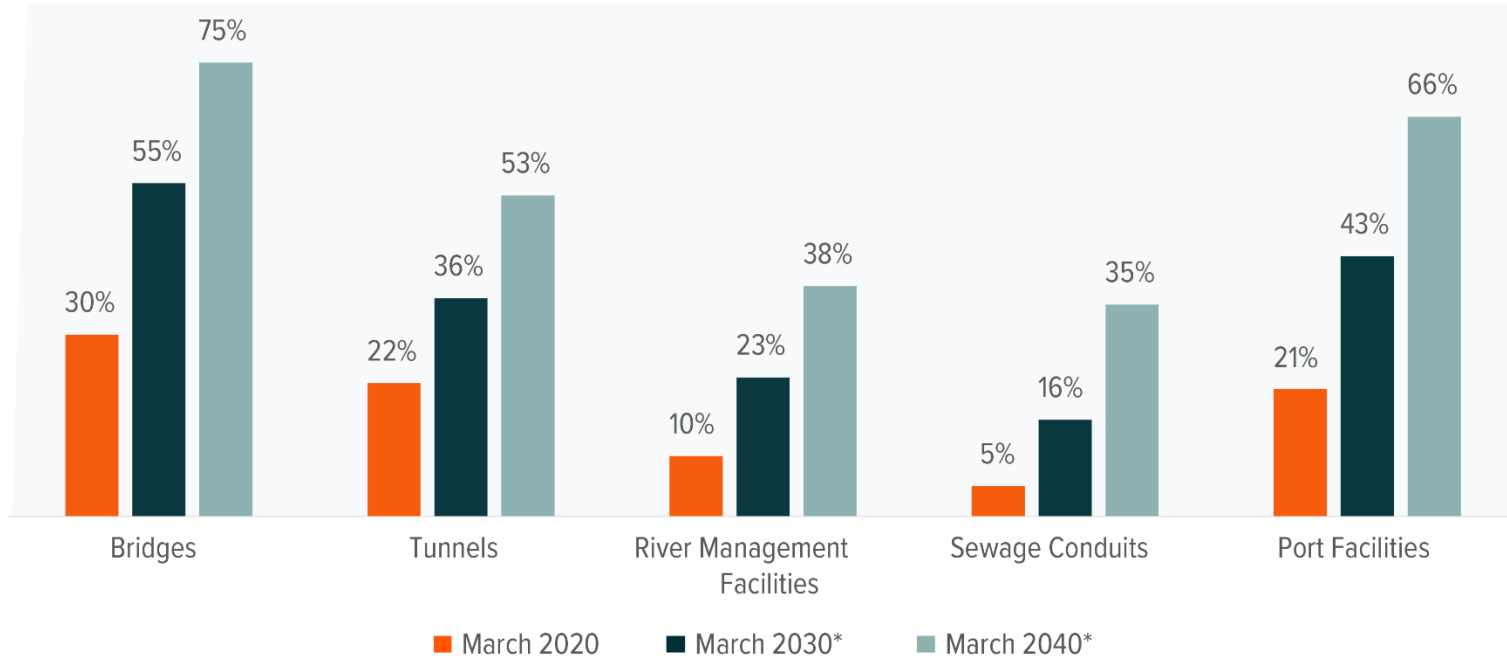
Infrastructure assets are becoming outdated in many parts of the world, which can amplify both the challenges and opportunities associated with supporting new technologies and adapting to climate change. For example, in Europe, the average power grid asset is 40 years old, making the EU’s grid one of the oldest in the world. As a result, it is estimated that basic grid infrastructure upgrades account for about 60% of the EU’s needed grid investments.¹⁷

In Japan, much of the country’s infrastructure was built during the period of economic growth between the 1950s and 1970s. As of 2023, more than 730,000 bridges, 11,000 tunnels, and 470,000 meters of sewer pipes were at least 50 years old.¹⁸ By 2030, up to 55% of the country’s bridges and 36% of the country’s tunnels will be over half a century old. Replacing these aging assets could require billions of dollars in annual investments.¹⁹



JAPAN'S AGING INFRASTRUCTURE ASSETS COULD REQUIRE SIGNIFICANT REPAIRS IN THE FUTURE (SHARE OF INFRASTRUCTURE ASSETS THAT ARE OVER 50 YEARS OLD, BY SEGMENT)

Sources: Global X ETFs with information and forecasts derived from: Smart City Korea. (2024, March 7). Japan's aging infrastructure maintenance, response to digitalization.



*Forecast

In Canada, over 40% of roads and bridges and 30% of water infrastructure are in very poor, poor, or fair condition.²⁰ In July 2024, a watermain break of a 50-year-old pipe in Calgary led to a month-long water emergency, highlighting the potential challenges from aging water infrastructure across the country.²¹ Notably, 150km of Vancouver's sewer mains are over 100 years old.²² Many power grid assets have also deteriorated over time. Utility Manitoba Hydro estimates that fixing aging generation stations, transmission towers, and power lines could cost billions of dollars over the coming years.²³ Without these repairs, the region faces increased risks for electricity supply disruptions.

Government Initiatives Could Unlock Trillions Towards Infrastructure Development

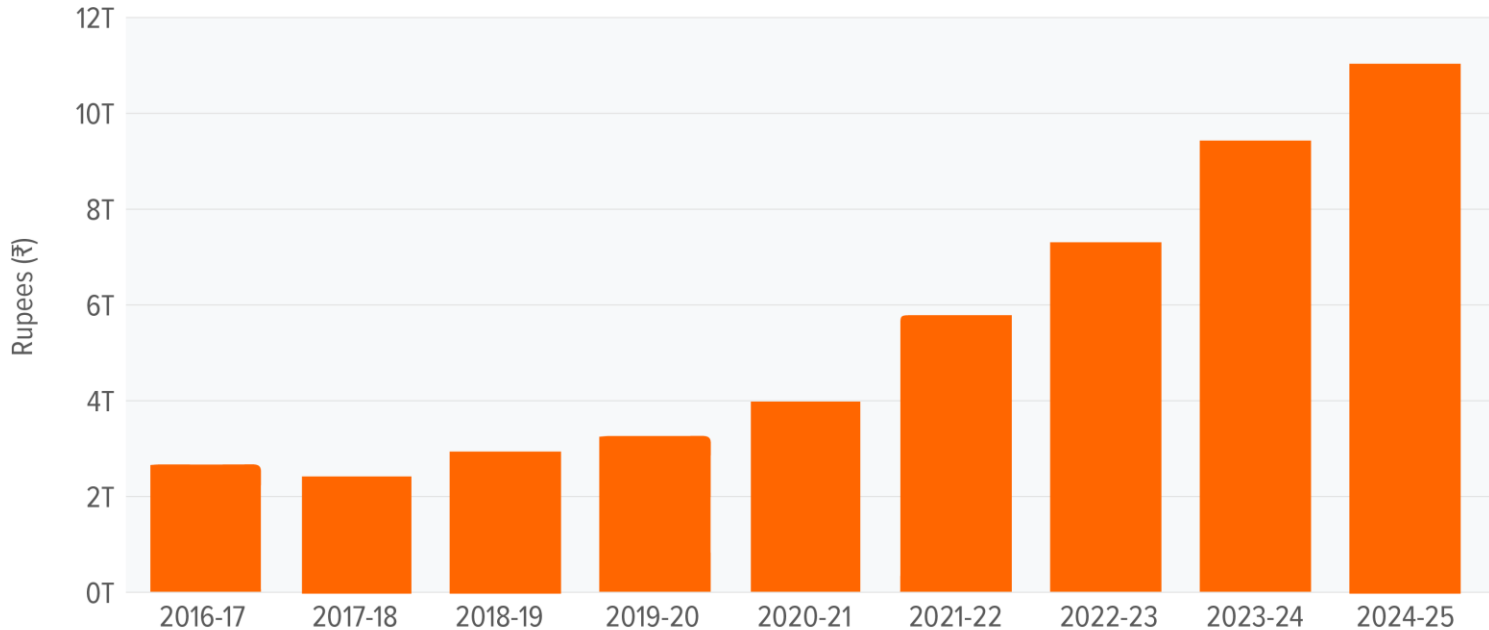
Many governments are allocating significant amounts of public funding to accelerate infrastructure development. For example, in July 2024, the European Commission selected 134 transport projects that are set to receive over €7 billion in grants from the EU's Connecting Europe Facility program. Railway projects will receive 80% of the announced funding, with waterways and maritime route projects also receiving funding.²⁴ In April 2024, the Canadian government launched a \$6 billion housing infrastructure fund to accelerate the construction of housing.²⁵

The Government of India plans to spend around 11.1 trillion rupees, or around \$133 billion, on infrastructure developments within the current fiscal year that runs from April 2024 to April 2025.²⁶ It is estimated that over \$530 billion of new infrastructure will come online in India over the next two years, with public funding a key underlying factor in the anticipated growth. Notably, the expected growth over the next two years could exceed all infrastructure built over the last 11 years.²⁷ In Japan, the government's proposed green transformation could require over \$1.1 trillion in public-private financing toward sustainable technologies and infrastructure, including renewable energy, carbon capture utilization and storage (CCUS), hydrogen, EVs, green houses, and sustainable industrial operations.²⁸



FEDERAL GOVERNMENT SPENDING ON INFRASTRUCTURE HAS INCREASED IN INDIA (ANNUAL FEDERAL GOVERNMENT SPENDING ON INFRASTRUCTURE, ₹ TRILLIONS)

Sources: Global X ETFs with information derived from: Reuters. (2024, July 23). India keeps infrastructure spend target unchanged at record 11.11 trln rupees for 2024-25.



Note: The 2024-2025 number is the final budget estimate for the current fiscal year. All other numbers are historic numbers.

IPAV: An ETF Targeting the Global Infrastructure Revival

The Global X Infrastructure Development Ex-U.S. ETF invests in pureplay companies that derive 50% or more of their revenues from the sub-themes outlined below. The fund seeks to cast a wide net for capturing international infrastructure development companies, so its only geographic limitation is that it excludes companies listed or domiciled in the U.S., Bangladesh, China (A-Shares and B-Shares), Kuwait, Pakistan, Russia, Egypt, Saudi Arabia. The sub-themes include:

- **Engineering and Construction Services:** Companies that provide the engineering, consulting, design, procurement, maintenance, dredging, and construction services for large-scale infrastructure projects. These projects can be energy generation and distribution infrastructure; transportation infrastructure such as roads, bridges, tunnels, and rail; water and wastewater infrastructure; telecommunications; seaports; and airports.
- **Infrastructure Transportation:** Companies that transport infrastructure raw materials and equipment, such as materials used in the business activities described in the other sub-themes, as well as aggregates, alumina, base metals, bauxite, coal, coke, iron ore, lumber, steel, and panels (solar panels, construction panels, etc.).
- **Raw and Composite Materials:** Companies that produce and supply composite and raw materials that are utilized in the development and construction of infrastructure projects. Examples include aluminum, steel, copper, nickel, tin, concrete, asphalt, cement, and specialty chemicals.
- **Construction Equipment and Products:** Companies that manufacture, distribute, sell, and/or rent heavy construction equipment, electric and fiber optic cables, pipes, cranes, pumps, and other products or equipment utilized in large-scale infrastructure projects.
- **Smart Grid Components:** Companies that manufacture or sell electrical components, energy storage devices, EV charging equipment, smart meters, and other applications related to smart grid construction.



Conclusion: Infrastructure Is Becoming an International Investment Opportunity

International infrastructure development opportunities are expanding rapidly, both for traditional assets like roads and bridges, as well as for more cutting-edge assets like EV chargers, data centers, and smart grids. Global infrastructure development is essential for supporting the growth of disruptive technologies and manufacturing, as well as addressing challenges associated with climate change and aging infrastructure assets. Shifting demographics around the world, including an increasingly urban population, will also require new infrastructure developments. For investors, the international infrastructure theme may present a compelling opportunity to gain exposure to international markets and potentially capitalize on generational investments driven by the intersection of social, demographic, technological, and energy consumption trends.

Related ETF

[IPAV – Global X Infrastructure Development Ex-US ETF](#)

Click the fund name above to view current performance and holdings. Holdings are subject to change. Current and future holdings are subject to risk.

Footnotes

1. In addition to the United States, IPAV also excludes companies listed or domiciled in Bangladesh, China (A-Shares and B-Shares), Kuwait, Pakistan, Russia, Egypt, and Saudi Arabia.
2. Bloomberg Intelligence. (2024, March 8). Generative AI races toward \$1.3 trillion in revenue by 2032.
3. Rho Motion. (2024, June). Quarterly Battery & EV Outlook: Q2 2024.
4. Forbes. (2024, August 8). Big Tech Battles on AI, Here's The Winner.
5. PYMNTS. (2024, May 23). Big Tech Companies Invest Billions in AI Infrastructure Abroad.
6. Ibid.
7. CIODive. (2024, August 5). Big tech banks on AI boom as infrastructure spending heads for trillion dollar mark.
8. International Energy Agency (IEA). (2024, April). Outlook for electric vehicle charging infrastructure.
9. Bloomberg. (2024, July 15). The World's Power Grids Are Failing as the Planet Warms.
10. Bloomberg. (2024, May 21). Grid Investment Must Outpace Renewables for Net Zero, BNEF says.
11. WSJ. (2024, May 2). Europe Takes Radical Steps to Boost Production; 'There is No Other Option'.
12. Politico. (2023, January 23). EU lines up 70 projects to rival China's Belt and Road infrastructure spending.
13. World Bank Group. (2023, April 3). Urban Development.
14. Ibid.
15. OECD, United Nations Economic Commission for Africa, and the African Development Bank. (2022, April 26). Africa's Urbanisation Dynamics 2022: The Economic Power of Africa's Cities.
16. OECD. (2024, April 9). Massive investment is needed in sustainable infrastructure to build climate resilience.
17. Breakthrough Energy. (2024, May 22). Europe's Grids Are Not Up to Grade.
18. International Trade Administration. (n.d.). Japan Infrastructure. Accessed on August 11, 2024.
19. Smart City Korea. (2024, March 7). Japan's aging infrastructure maintenance, response to digitalization.
20. The Canadian Infrastructure Report Card. (2019, October). Canadian Infrastructure Report Card 2019.
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22. Vancouver Sun. (2024, July 9). 150 km of Vancouver sewers are more than 100 years old.
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25. Reuters. (2024, April 2). Canada launches \$6 bln housing fund in bid to quell housing crisis.
26. Morningstar. (2024, July 24). India Outlines Plans to Spend Billions on Infrastructure, Jobs in New Budget.
27. Bloomberg. (2024, May 26). Modi Bets His Legacy on \$534 Billion Infrastructure Boom in India.
28. Government of Japan. (2023, January). Overview of Japan's Green Transformation (GX).

This material represents an assessment of the market environment at a specific point in time and is not intended to be a forecast of future events, or a guarantee of future results. This information is not intended to be individual or personalized investment advice and should not be used for trading purposes. Please consult a financial advisor for more information regarding your situation.

Investing involves risk, including the possible loss of principal. Narrowly focused investments typically exhibit higher volatility. Investments in infrastructure-related companies have greater exposure to the potential adverse economic, regulatory, political and other changes affecting such entities. Investment in infrastructure-related companies are subject to various risks including governmental regulations, high interest costs associated with capital construction programs, costs associated with compliance and changes in environmental regulation, economic slowdown and excess capacity, competition from other providers of services and other factors. International investments may involve risk of capital loss from unfavorable fluctuation in currency values, from differences in generally accepted accounting principles or from social, economic or political instability in other nations. Emerging markets involve heightened risks related to the same factors as well as increased volatility and lower trading volume. IPAV is non-diversified.



Shares of ETFs are bought and sold at market price (not NAV) and are not individually redeemed from the Fund. Brokerage commissions will reduce returns.

Carefully consider the fund's investment objectives, risks, and charges and expenses before investing. This and other information can be found in the fund's full or summary prospectuses, which may be obtained at globalxetfs.com. Please read the prospectus carefully before investing.

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